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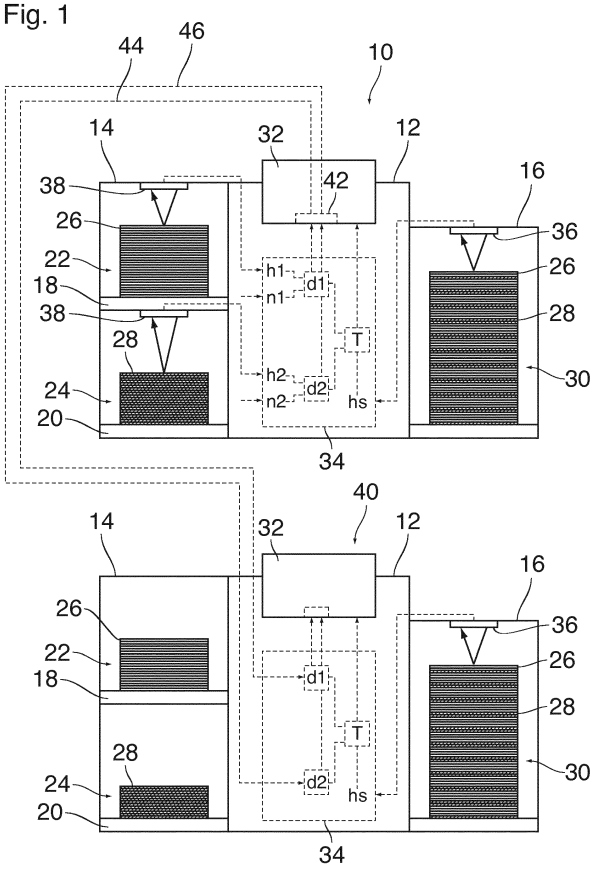
(54) DEVICE FOR PROCESSING MEDIA SHEETS

(57) A sheet processing device (10), comprising a measuring equipment (38) for measuring a property of media sheets (26, 28) to be processed in the device, and a controller (34) arranged to control a processing operation of the device on the basis of the measured property, wherein the device comprises a media property output interface (42) connected to at least one data line (44, 46) for transmitting the measured property to another sheet processing device (40).

Fig. 1



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Description

[0001] The invention relates to a sheet processing device comprising a measuring equipment for measuring a property of media sheets to be processed in the device, and a controller arranged to control a processing operation of the device on the basis of the measured property.

[0002] More particularly, the invention relates to a printing device in which an image is formed on one or both sides of each media sheet.

[0003] An example of a property to be measured is the thickness of media sheets of a given type. This information may be needed for example for predicting the time when the maximum storage capacity of a sheet output stacker of the printing device will be reached and the stack of printed sheets will have to be removed. In order to predict how the height of the stack increases when sheets are processed and discharged onto the stack, it is necessary to know the thickness of the individual sheets.

[0004] In an ink jet printer, for example, the thickness information may also be needed for appropriately setting the height of the print head relative to the sheet transport path on which the sheets pass by underneath the print head.

[0005] As another example, when the printed sheets are intended for booklets, the measured sheet thickness may be used for calculating a so-called image creep that typically occurs when a booklet is formed.

[0006] Other examples of relevant media sheet properties that may be measured are the grain direction of paper sheets, the weight of the sheets, their stiffness, humidity content, and the like.

[0007] If the type of the media sheets to be processed is known, it is frequently possible to retrieve the relevant sheet properties from a media catalogue in which the media type is listed. However, there may be cases where the media type is not known or the property information in the media catalogue is not exact or not reliable enough, for example, when the media properties depend upon varying environmental conditions such as temperature, air humidity and the like. For this reason, many printing devices have suitable measuring equipment for measuring the relevant properties of the media sheets that have been loaded into the device.

[0008] In a typical print shop, a plurality of printing devices are available, and these devices may have different features and also different capabilities as far as the measurement of the media sheet properties is concerned. US 2012/287464 discloses a method of synchronizing media lists that are stored in different printing devices, so that the information on media sheet properties, as retrieved from a media catalogue, may be exchanged between the printing devices.

[0009] It is an object of the invention to provide a sheet processing device which permits a more efficient management of information on media sheet properties in a system comprising a plurality of processing devices.

[0010] According to the invention, in order to achieve this object, the processing device has a media property output interface connected to at least one data line for transmitting the measured property to another sheet processing device .

[0011] Consequently, information on media sheet properties that is not available in a media list but has been measured in the device according to the invention can be made available also for other devices, so that these other devices need not have an expensive measuring equipment of their own. The media property output interface is linked to an input interface of at least one other device by a data line, so that the property information may be communicated electronically without intervention of an operator.

[0012] More specific optional features of the invention are indicated in the dependent claims.

[0013] When the processing device according to the invention is a printing device, the further processing device may be another printing device but might also be another kind of processing device, e.g. a finisher in which the information on the sheet properties may also be relevant or at least useful. Conversely, the device according to the invention may be a finisher or other device in which the measuring equipment is installed, so that the measured properties may be communicated to other devices, e.g. to printing devices.

[0014] Subject of the invention is also a sheet processing system having a network for exchanging media sheet property information between at least one processing device according to the invention and at least one further processing device.

[0015] In a useful embodiment of such a printing system, a media managing module is connected to the network and is arranged to retrieve measured data on media properties from a plurality of devices that are also connected to the network, and to distribute these data to other devices in the network. The data specifying the media properties may be accompanied by data that specify the measuring tolerances of the device with which the measurement has been made. Then, based on the tolerance data, the measuring module may select, for each property, a processing device having a measuring equipment that is capable of measuring the relevant data with the highest accuracy.

[0016] Embodiment examples will now be described in conjunction with the drawings, wherein:

Fig. 1 is a diagram of a sheet processing system comprising two printing devices one of which is configured according to the invention; and

Fig. 2 is a diagram of a sheet processing system with a plurality of processing devices linked by a network.

[0017] As an example of a sheet processing device according to the invention, Fig. 1 shows a printing device 10 comprising a printer 12, a sheet input module 14 con-

nected to a sheet input side of the printer, and an output stacker 16 connected to a sheet output side of the printer.

[0018] In the example shown, the sheet input module 14 has two input trays 18 and 20 with a stack 22, 24 of media sheets 26, 28 being loaded on each tray. The media sheets 26 on the tray 18 are of a different type and have different properties than the sheets 28 on the tray 20. As is commonly known in the art, the input module 14 is arranged to withdraw the media sheets one by one from the respective stack and to feed them into the printer 12 on demand and in accordance with the print job specifications. The printed sheets are then output to the output stacker 16 where the media sheets 26 of the first type and the media sheets 28 of the second type are stacked in a mixed sequence on a stack 30.

[0019] The printer 12 has a user interface 32 and a controller 34 which controls the operation of the entire printing device 10.

[0020] Conceivably, the output stacker 16 can only accommodate a stack 30 up to a certain maximum height. At a suitable time before this height is reached, an overflow signal should be output via the user interface 32 in order to alert the operator that the stack 30 should be removed in order for the print process to be continued without delay. It is therefore desirable to predict, on the basis of the sheets that have been scheduled for printing, an expected time T when the capacity of the output stacker 16 becomes exhausted. For that purpose, the output stacker 16 includes a measuring equipment 36, e.g. an optical distance sensor, which is capable of measuring the current height hs of the stack 30 with high accuracy and to signal the measured height to the controller 34.

[0021] However, in order to obtain an accurate prediction of the time T, it is also necessary to know the thickness of the sheets 26, 28 that will be added to the stack 30 until the maximum height is reached. The information as to whether these sheets are media sheets 26 of the first type or media sheets 28 of the second type is available in the controller 34 which has scheduled the sheets for printing. However, when the thickness of the individual sheets cannot be read from a stored media list, it is necessary to measure also the thicknesses of the sheets 26 and 28. For this reason, also the input module 14 has measuring equipment 38 associated with each tray 18, 20 for accurately measuring the height of each stack 22, 24. Thus, the controller 34 receives a signal indicating the height h1 of the stack 22, and a signal indicating the height h2 of the stack 24. Further, the controller 34 counts the number n1 of the sheets 26 that are withdrawn from the stack 22 and the number n2 of sheets 28 that are withdrawn from the stack 24. Then, when a certain number of sheets 26 have been withdrawn, it is possible to calculate the thickness d1 of an individual sheet 26 by dividing the change in the height h1 that has occurred during a certain time interval by the number of sheets that have been withdrawn in that time interval. Similarly, the thickness d2 of an individual sheet 28 can be calculated from the measured height h2 and the counted number n2.

[0022] Whenever a sheet 26 for the first time is placed on top of the stack 30 in the output stacker, the height hs will be increased by d1, and when a sheet 28 of the second type is stacked, the height hs will be increased by d2. Thus, on the basis of the sheets that are scheduled for printing, it is possible for the controller 34 to calculate the time T at which the height hs will have reached the maximum value, so that an overflow signal can be output at an appropriate timing and, if the operator does not react in time, the printer 12 can be shut down before any damage is caused.

[0023] As is shown in Fig. 1, the processing system comprises a second printing device 40 which has basically the same design as the first printing device 10 described above, but with the difference that the sheet input module 14 does not have the measuring equipment 38.

[0024] More generally, it may assumed that the sheet input module of the second printing device 40 does have some equipment for coarsely measuring the height of the stacks 22 and 24, but not with the high accuracy that is achieved by the equipment 38. It will also be possible that the input module 14 and the controller 34 of the second printing device are not capable of counting and storing the numbers of sheets that are withdrawn from the stacks 22, 24. Consequently, it is not possible to measure the thicknesses d1 and d2 of the sheets in the second printing device.

[0025] In order to nevertheless predict the time T in the second printing device 40 on the basis of the height of the stack 30 measured with the measuring equipment 36, it would be possible to store estimated values for the sheet thicknesses in the controller 34.

[0026] In the proposed printing system, however, in order to make the prediction of the time T in the second printing device easier and more reliable, the first printing device 10 has a media property output interface 42 connected to the controller 34 of the second printing device 40 via data lines 44 and 46. Consequently, when the sheets stacked on the trays18, 20 of the second printing device 40 are of the same type as the sheets on the respective trays in the first printing device 10, the information on the thicknesses d1 and d2 that is available in the first printing device 10 can also be used in the second printing device 40 for predicting the time T (or for any other purpose).

[0027] Similarly, if the first printing device 10 has any other measuring equipment for measuring other properties of the media sheets 26 and 28, such as the stiffness of the sheets (which information may be needed for appropriately controlling blowers with which the sheets are deflected on their way through the printer 12), or the humidity content of the sheets (needed for calculating the durations and/or temperatures of fuse processes in the printer 12). In such a case, the sheet property output interface 42 will be arranged to communicate also this information to the second printing device 40.

[0028] Of course, the concept described above may

be extended to processing systems comprising more than two printing devices or other sheet processing devices.

[0029] As an illustrative example, Fig. 2 shows a sheet processing system with four sheet processing devices 48, 50 and a media managing module 52 interconnected by a data network 54. By way of example, it shall be assumed that three of the four processing devices, i.e. the processing devices 48, are configured in accordance with the invention, i.e. have measuring equipment as well as a media property output interface 42 connecting to the network 54.

[0030] The network 54 is configured to permit bi-directional communication between the media managing module 52 on the one hand and each of the processing devices 48, 50 on the other hand. Optionally, it may also permit direct communication among the different sheet processing devices 48, 50.

[0031] The data structure of the data that are transmitted via the network 54 has been expanded in a table 56. It shall be assumed that the processing devices 48, 50 are capable of processing media sheets which belong to different media types, designated here as "media type 1", "media type 2", etc.. More precisely, for each of the media types, there is at least one of the processing devices 48, 50 that is capable of processing the sheets of this type.

[0032] The media sheets of each type may have a number of properties, such as thickness, stiffness, etc. The properties have been shown here only for "media type 1" and have been designated as "property 1.1", property 1.2", etc.. Three different data items "source", "value" and "tolerance" are associated with each property. The item "source" identifies one of the processing devices 48 (having a media property output interface 42) which has been designated by the media managing module 52 to provide the measurement results for the pertinent property. The item "value" specifies the value of that property as measured in the processing device 48 that has been designated as "source". The item "tolerance" specifies the accuracy with which the property can be measured by the source.

[0033] In a preparatory step, the media managing module 52 queries all connected processing devices 48, 50 for each media type and each property thereof whether it is capable of measuring that property and, if yes, with which accuracy. In response, the processing devices 48 transmit the items "tolerance" that specify these accuracies to the managing module 52. Then, the module 52 selects the processing device that can measure the property with the highest accuracy and designates this device as "source".

[0034] Subsequently, whenever the "source" is operating and is processing sheets of the media type for which it has been designated as source, it transmits the measured results for the property for which it has been designated as source to the managing module 52, and the managing module relays these data to all the other processing devices where the information is needed. Optionally, the processing devices may receive the data items "value" directly from the source.

[0035] In this way, it is assured that all processing devices will always utilize the most accurate and most reliable property information that is available.

[0036] It will be understood that the accuracy with which a certain property can be measured in a given processing device 48 may depend upon the media type. For example, when the property to be measured is the sheet thickness, one of the processing devices 48 may be selected for measuring the thickness of sheets of the media type 1 whereas the thickness of sheets of the media type 2 is measured more exactly in another of the processing devices 48.

[0037] In an alternative embodiment the value for a source parameter is assigned by an operator. If in a certain configuration of processing systems it is known which of the devices performs best for a measurement of a property of a media, such a device can be assigned by the operator via the User Interface as source for that property of a certain media type.Data network 54 may be implemented as a wireless network; likewise data lines 44 and 46 may be implemented as wireless connections.

Claims

1. A sheet processing device (10; 48), comprising a measuring equipment (38) for measuring a property of media sheets (26, 28) to be processed in the device, and a controller (34) arranged to control a processing operation of the device on the basis of the measured property, **characterized in that** the device comprises a media property output interface (42) connected to at least one data line (44, 46) for transmitting the measured property to another sheet processing device (40).

2. The device according to claim 1, wherein the measuring equipment (38) is arranged to measure a thickness of the media sheets.

3. A sheet processing system comprising a plurality of sheet processing devices (48, 50), wherein at least one of the sheet processing devices is a device (48) according to any of the claims 1 to 2, and the media property output interface (42) of that device is connected to the other devices (48, 50) by a data network (54).

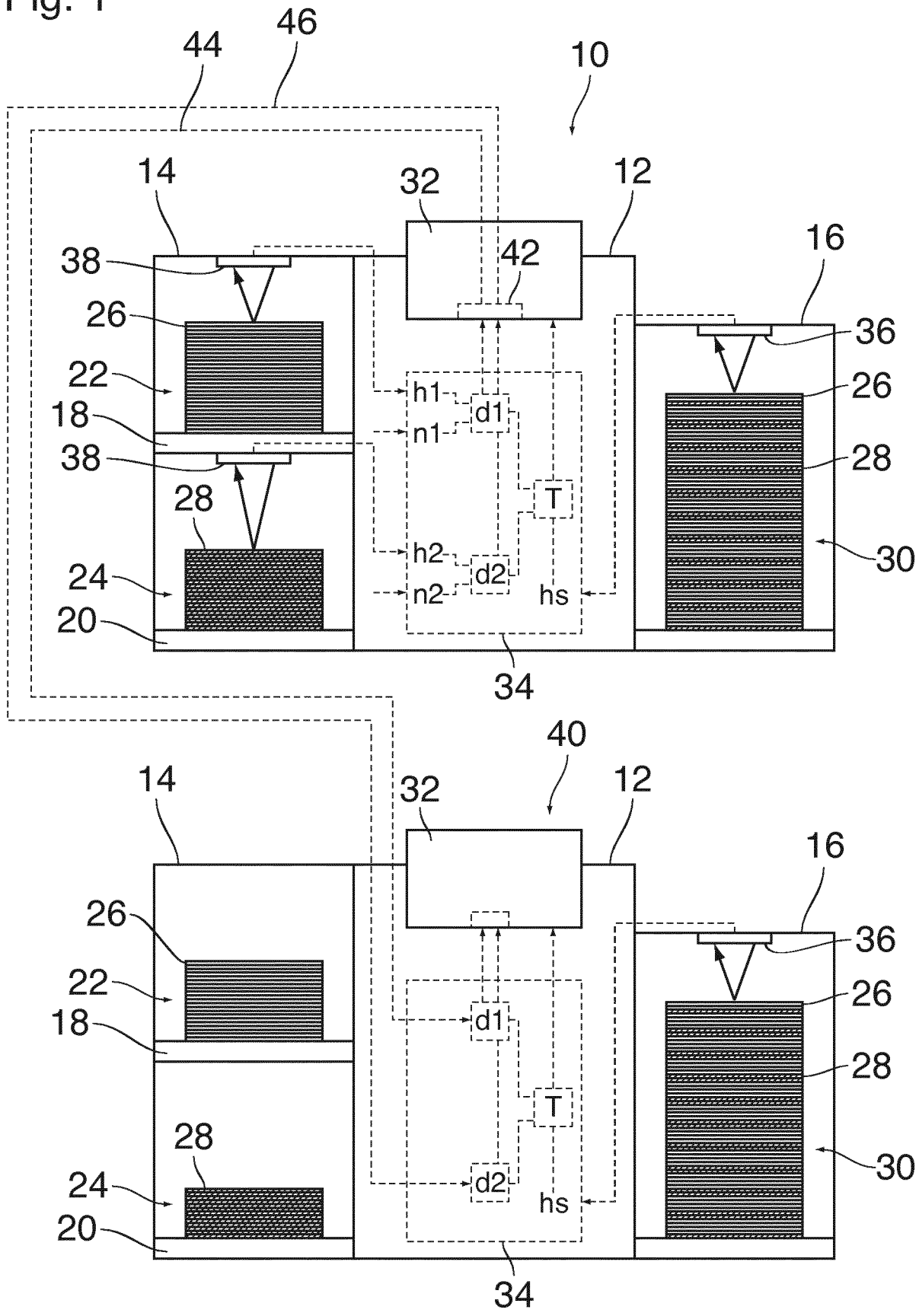
4. The system according to claim 3, wherein at least two of the processing devices are devices (48) according to any of the claims 1 to 2, and a media managing module (52) is connected to the network (54) and is arranged to manage the exchange of measured property data among the processing devices

(48, 50).

5. The system according to claim 4, wherein the media property output interfaces (42) of at least two of the devices (48) are capable of transmitting tolerance data specifying an accuracy with which the measured property can be measured in this device, and the media managing module (52) is arranged to select from among the media property output interfaces (42) the one interface from which the tolerance signal indicates the highest accuracy and to designate that interface as a source from which the measured property is communicated to the other devices.

6. The system according to claim 4, wherein the media managing module is arranged to select from the media output interfaces the one interface that is designated by an operator as source from which the measured property is communicated to the other devices.

Fig. 1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h2
d2
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n2
hs
20
34
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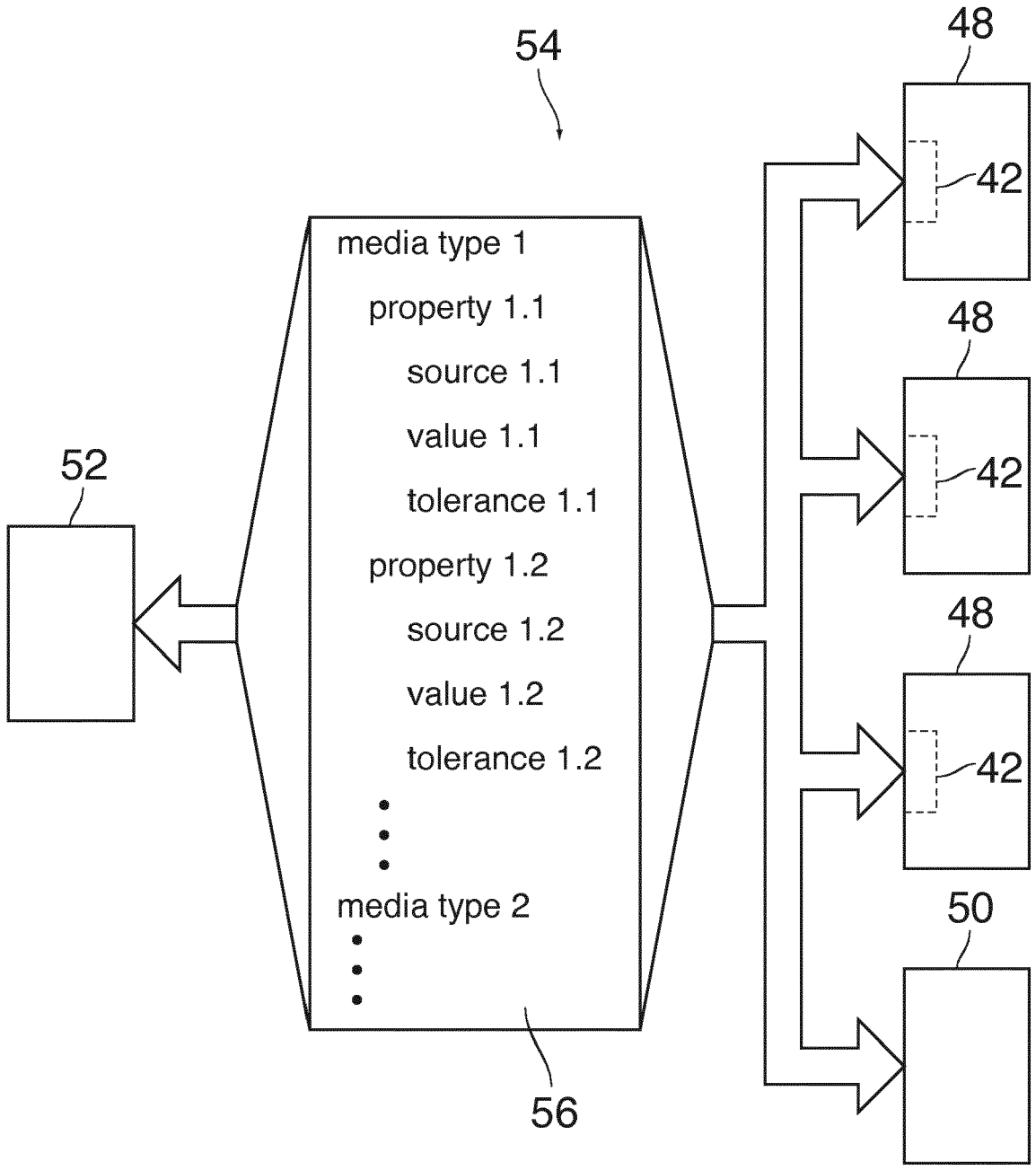
d2
hs
20
34

Fig. 2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48
42
48
42
48
42
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52
media type 1
property 1.1
source 1.1
value 1.1
tolerance 1.1
property 1.2
source 1.2
value 1.2
tolerance 1.2
media type 2
56

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EUROPEAN SEARCH REPORT

Application Number
EP 16 19 2853

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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A,D	US 2012/287464 A1 (GERRITS ANTONIUS MARIA [NL] ET AL) 15 November 2012 (2012-11-15) * paragraph [0007] - paragraph [0012]; claim 1 *	1-6	

TECHNICAL FIELDS SEARCHED (IPC)

B41J

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	16 March 2017	Wehr, Wolfhard

CATEGORY OF CITED DOCUMENTS

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16-03-2017

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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US 2012287464 A1	15-11-2012	EP 2523447 A1	14-11-2012
		US 2012287464 A1	15-11-2012

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